FIG. 1

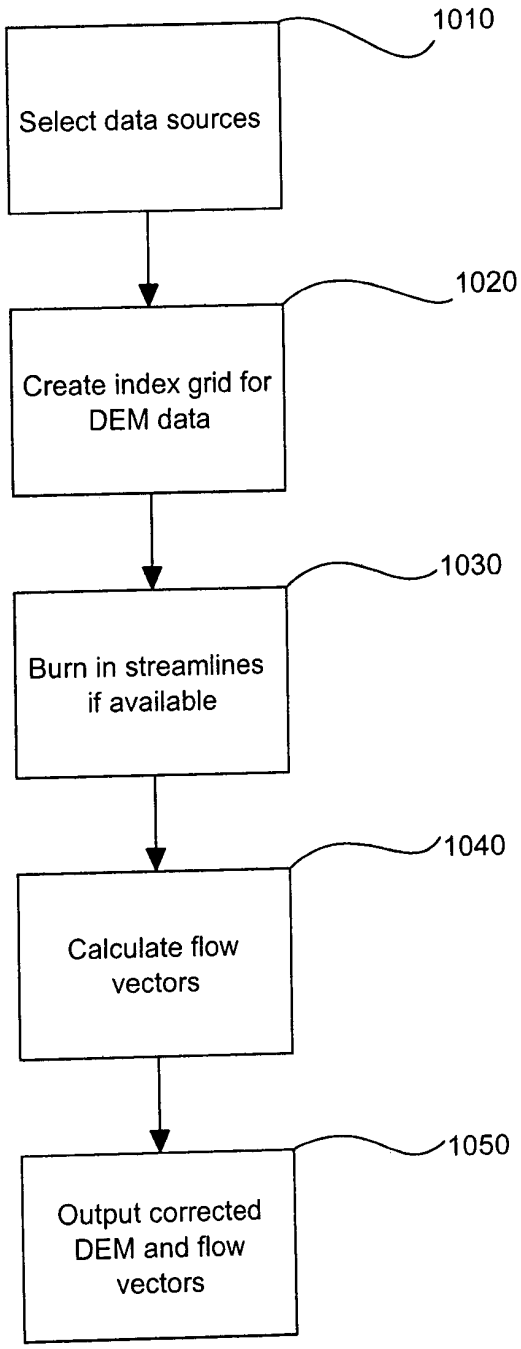

1010
Select data sources
1020
Create index grid for DEM data
1030
Burn in streamlines if available
1040
Calculate flow vectors
1050
Output corrected DEM and flow vectors

FIG. 2

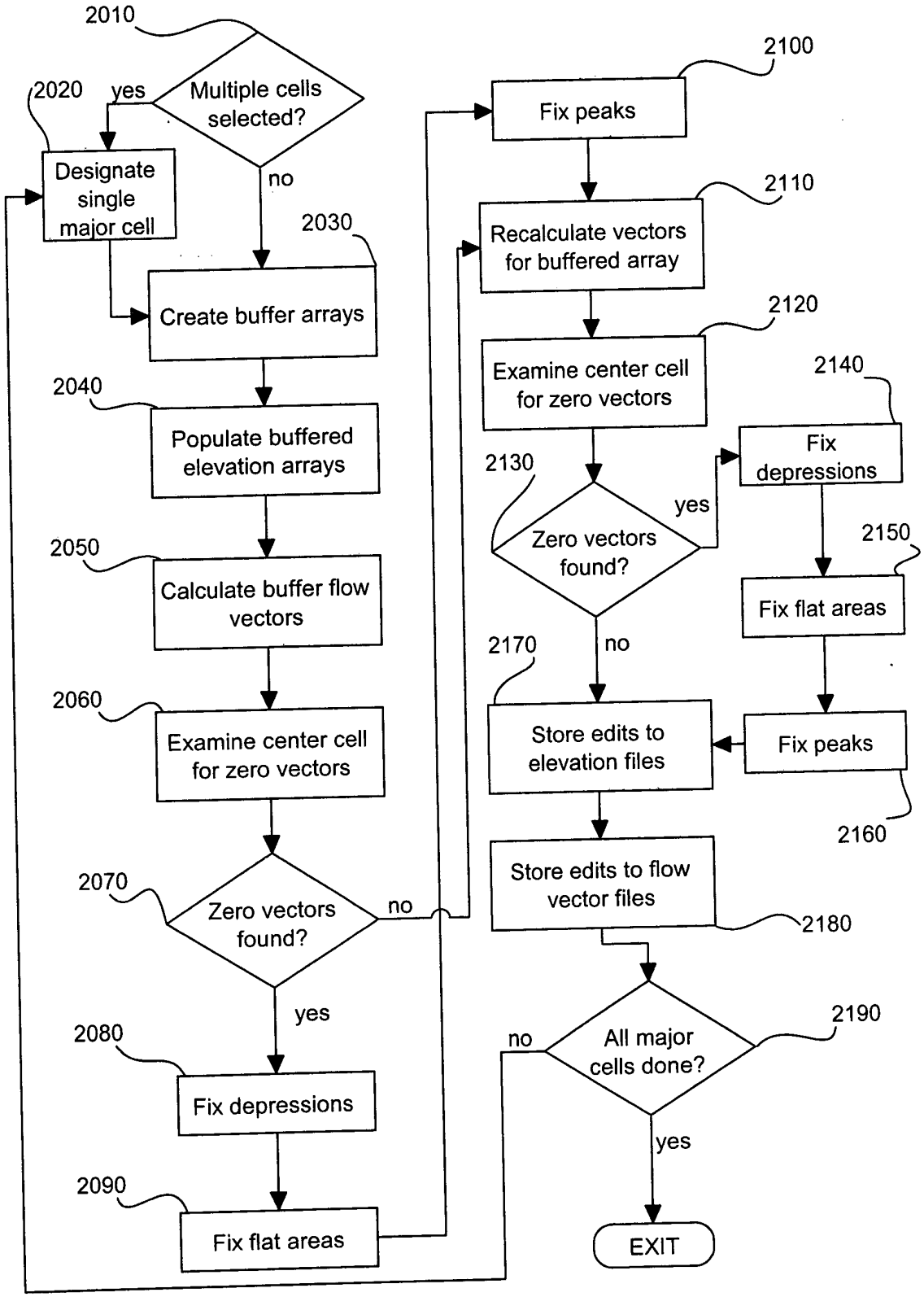

2010
Multiple cells selected?
yes
no
2020
Designate single major cell
2030
Create buffer arrays
2040
Populate buffered elevation arrays
2050
Calculate buffer flow vectors
2060
Examine center cell for zero vectors
2070
Zero vectors found?
yes
no
2080
Fix depressions
2090
Fix flat areas
2100
Fix peaks
2110
Recalculate vectors for buffered array
2120
Examine center cell for zero vectors
2130
Zero vectors found?
yes
no
2140
Fix depressions
2150
Fix flat areas
2160
Fix peaks
2170
Store edits to elevation files
2180
Store edits to flow vector files
2190
All major cells done?
no
yes
EXIT

FIG. 3

R0010C0006	R0010C0007	R0010C0008	R0010C0009	R0010C0010
R0009C0006	R0009C0007	R0009C0008	R0009C0009	R0009C0010
R0008C0006	R0008C0007	R0008C0008	R0008C0009	R0008C0010
R0007C0006	R0007C0007	R0007C0008	R0007C0009	R0007C0010
R0006C0006	R0006C0007	R0006C0008	R0006C0009	R0006C0010

FIG. 4

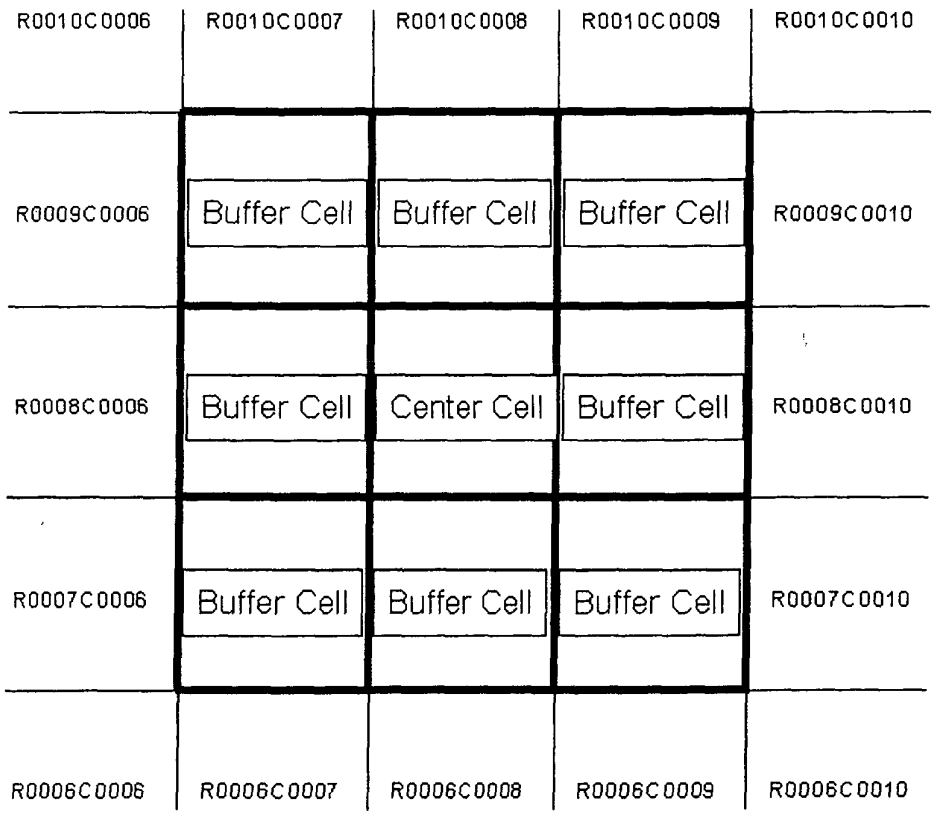

R0010C0006
R0010C0007
R0010C0008
R0010C0009
R0010C0010
R0009C0006
Buffer Cell
Buffer Cell
Buffer Cell
R0009C0010
R0008C0006
Buffer Cell
Center Cell
Buffer Cell
R0008C0010
R0007C0006
Buffer Cell
Buffer Cell
Buffer Cell
R0007C0010
R0006C0006
R0006C0007
R0006C0008
R0006C0009
R0006C0010

FIG. 5

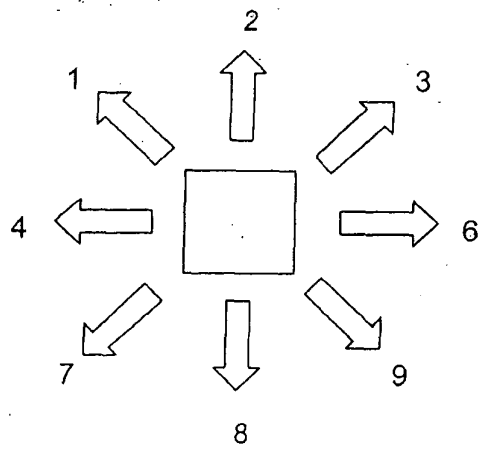

1
2
3
4
6
7
8
9

FIG. 6

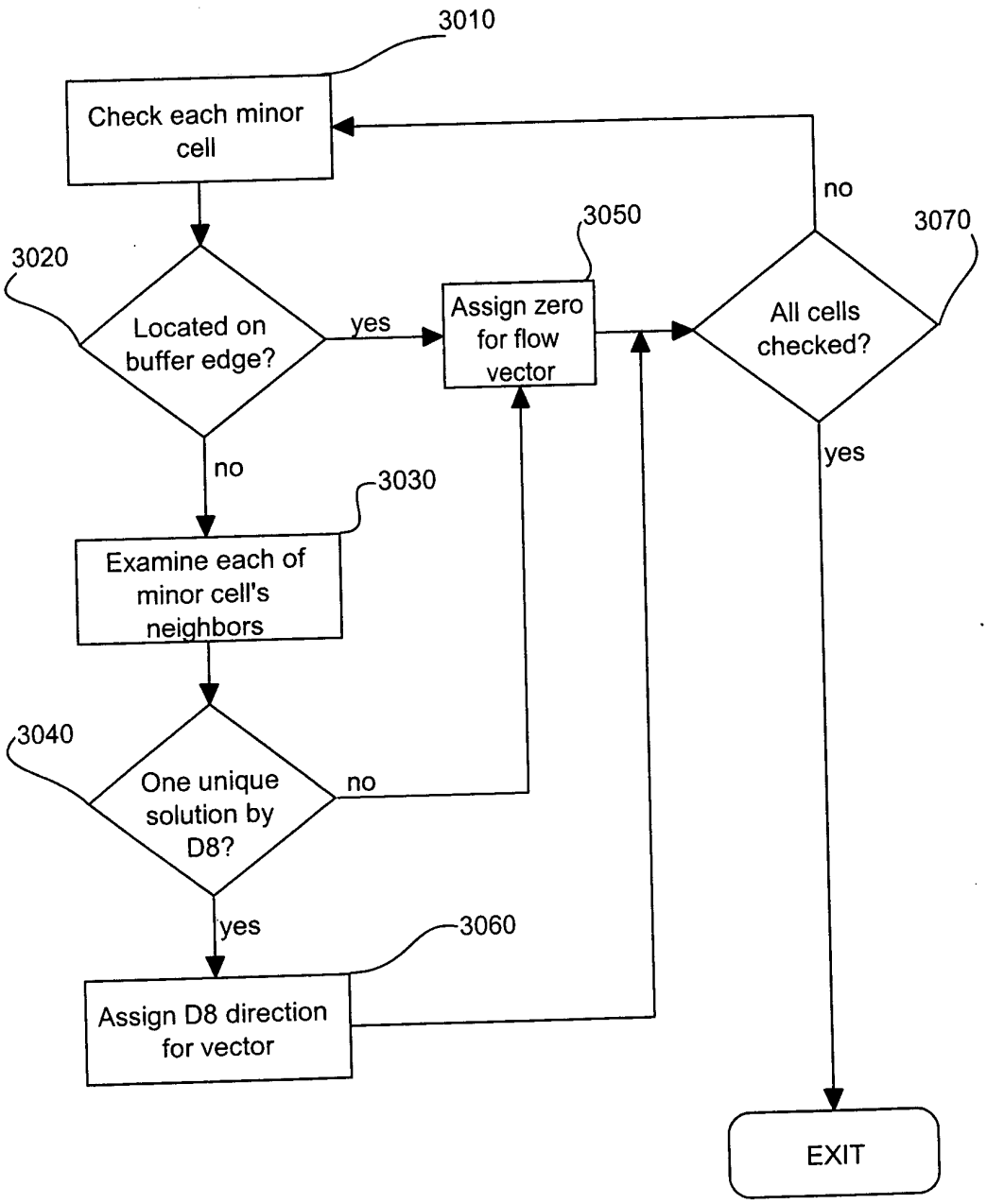

3010
Check each minor cell
3020
Located on buffer edge?
yes
3050
Assign zero for flow vector
3070
All cells checked?
no
yes
no
3030
Examine each of minor cell's neighbors
3040
One unique solution by D8?
no
yes
3060
Assign D8 direction for vector
EXIT

FIG. 7

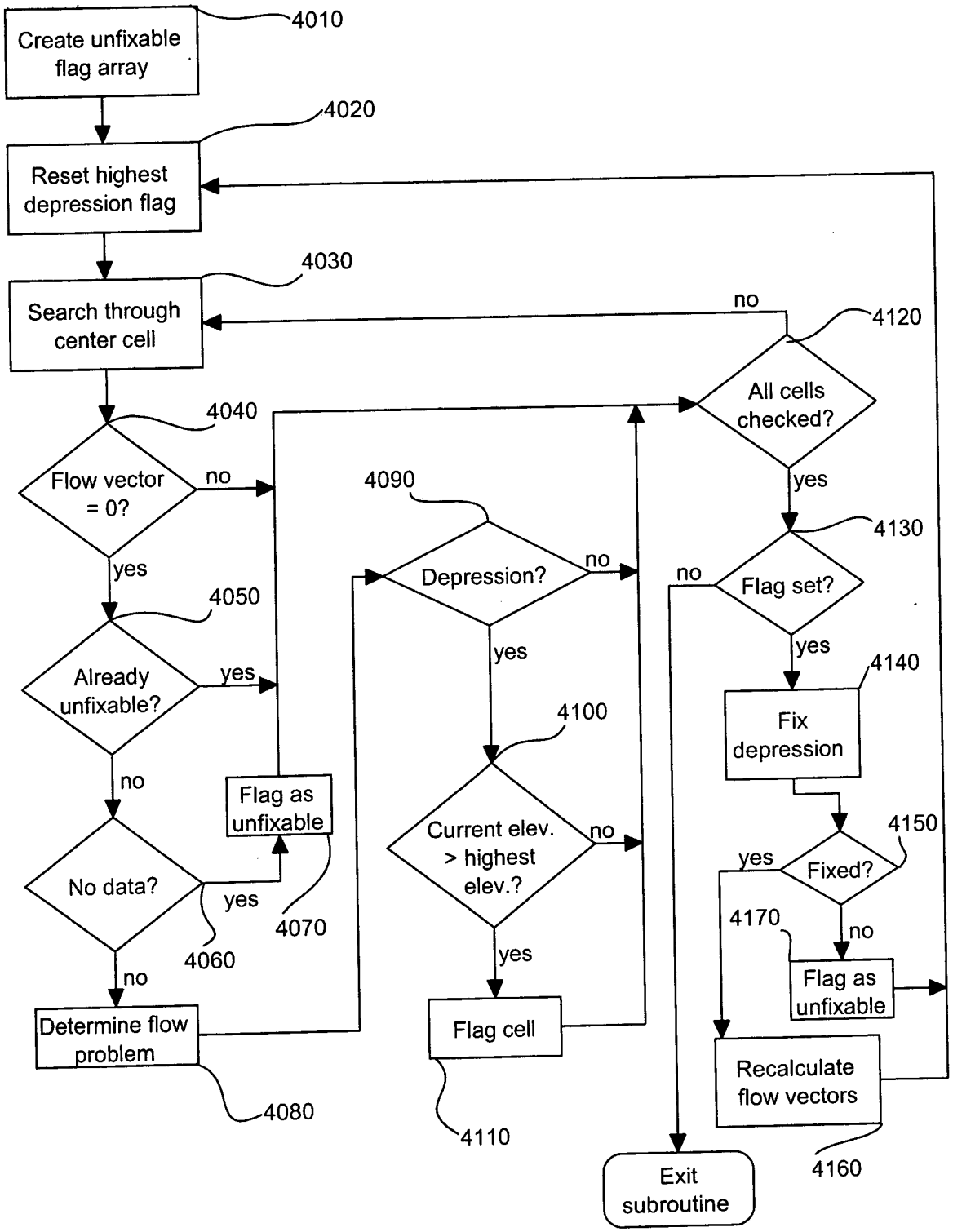

Create unfixable flag array
4010
Reset highest depression flag
4020
Search through center cell
4030
Flow vector = 0?
4040
no
yes
Already unfixable?
4050
yes
no
No data?
yes
4060
Flag as unfixable
4070
no
Determine flow problem
4080
Depression?
4090
no
yes
Current elev. > highest elev.?
4100
no
yes
Flag cell
4110
All cells checked?
4120
no
yes
Flag set?
4130
no
yes
Fix depression
4140
Fixed?
4150
yes
no
4170
Flag as unfixable
Recalculate flow vectors
4160
Exit subroutine

FIG. 8

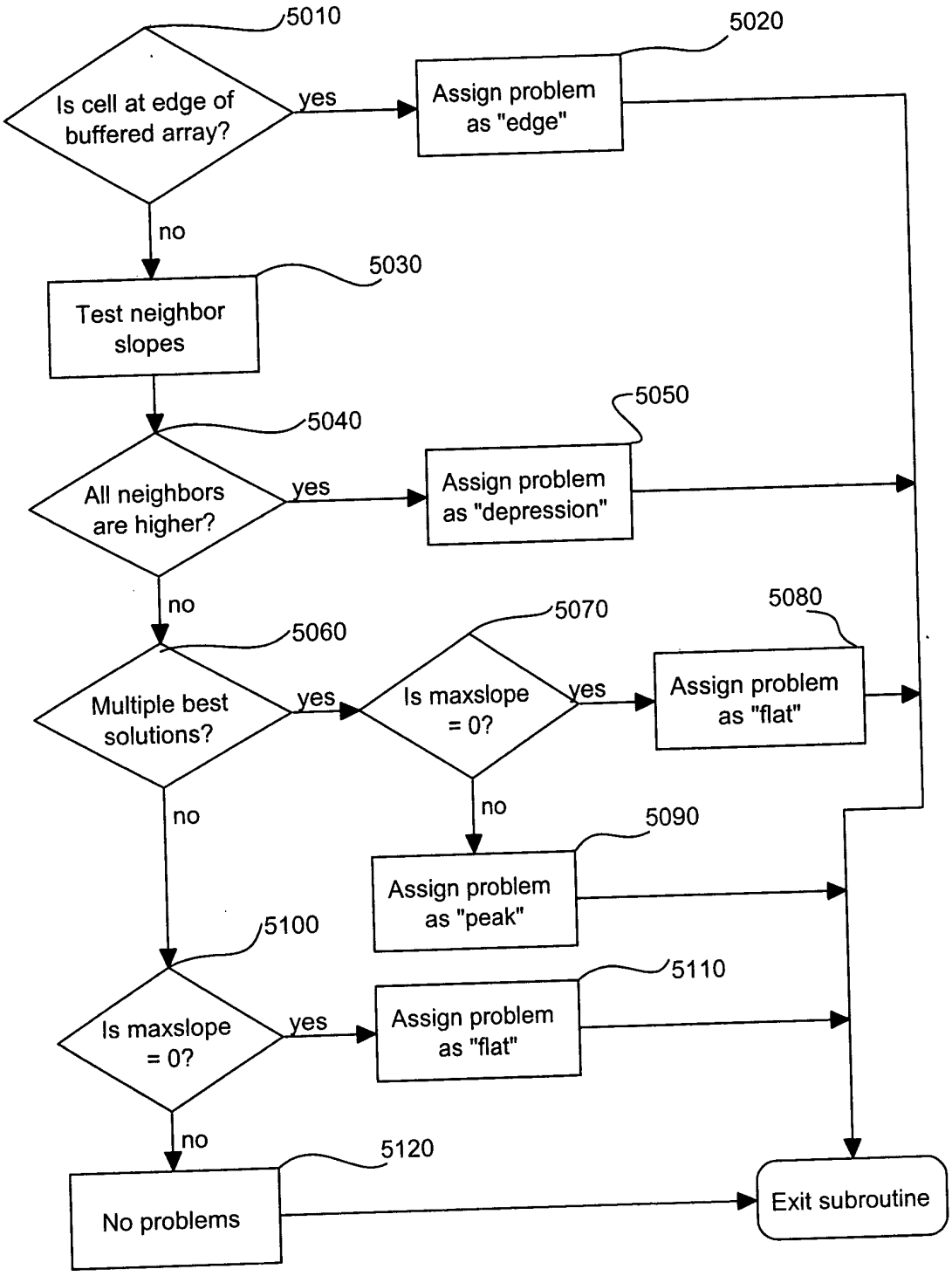

5010
Is cell at edge of buffered array?
yes
5020
Assign problem as "edge"
no
5030
Test neighbor slopes
5040
All neighbors are higher?
yes
5050
Assign problem as "depression"
no
5060
Multiple best solutions?
yes
5070
Is maxslope = 0?
yes
5080
Assign problem as "flat"
no
5090
Assign problem as "peak"
no
5100
Is maxslope = 0?
yes
5110
Assign problem as "flat"
no
5120
No problems
Exit subroutine

FIG. 9A

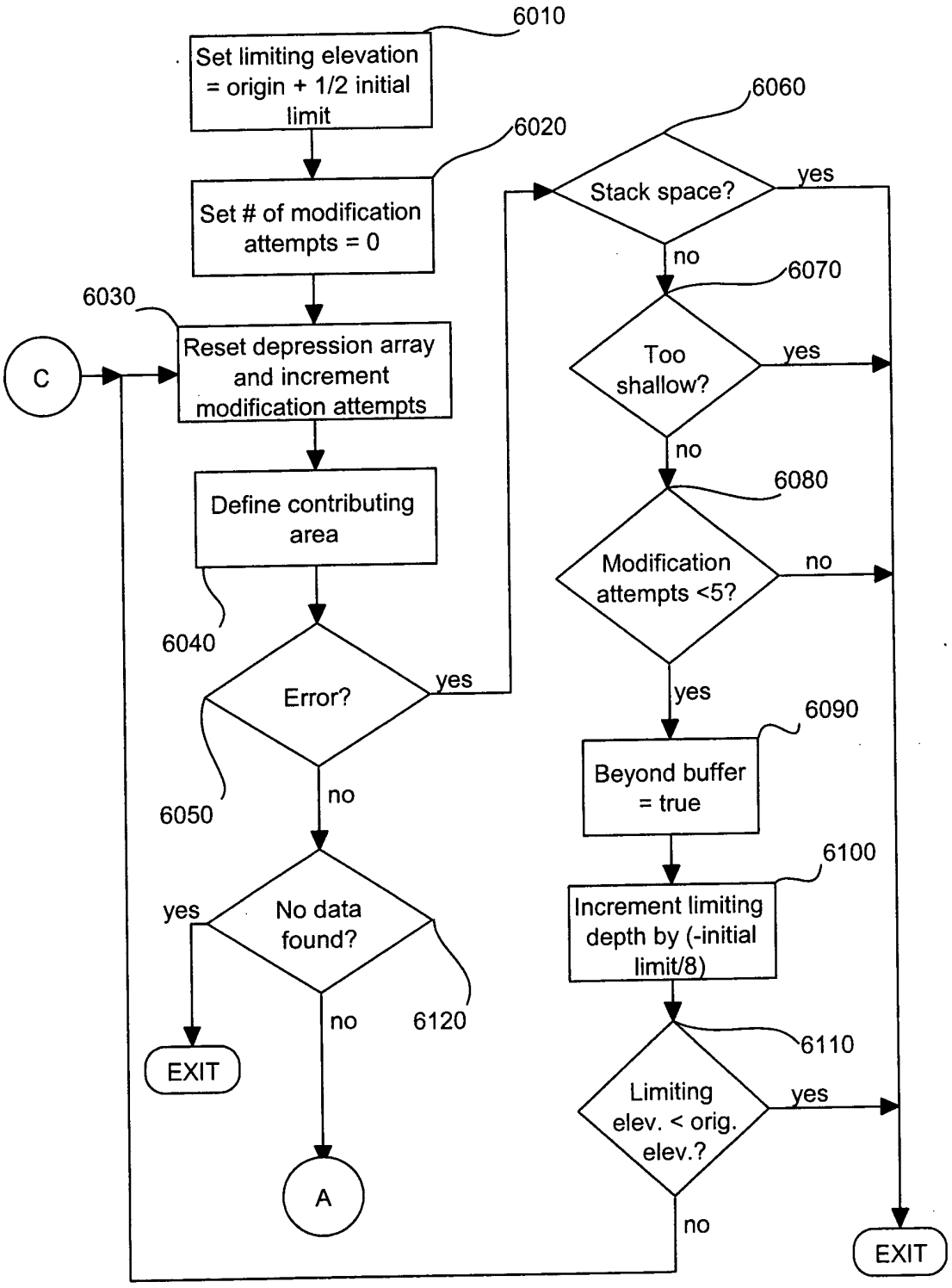

6010
Set limiting elevation = origin + 1/2 initial limit
6020
Set # of modification attempts = 0
6030
Reset depression array and increment modification attempts
C
Define contributing area
6040
Error?
yes
6050
no
No data found?
yes
EXIT
no
6120
A
6060
Stack space?
yes
no
6070
Too shallow?
yes
no
6080
Modification attempts <5?
no
yes
6090
Beyond buffer = true
6100
Increment limiting depth by (-initial limit/8)
6110
Limiting elev. < orig. elev.?
yes
no
EXIT

FIG. 9B

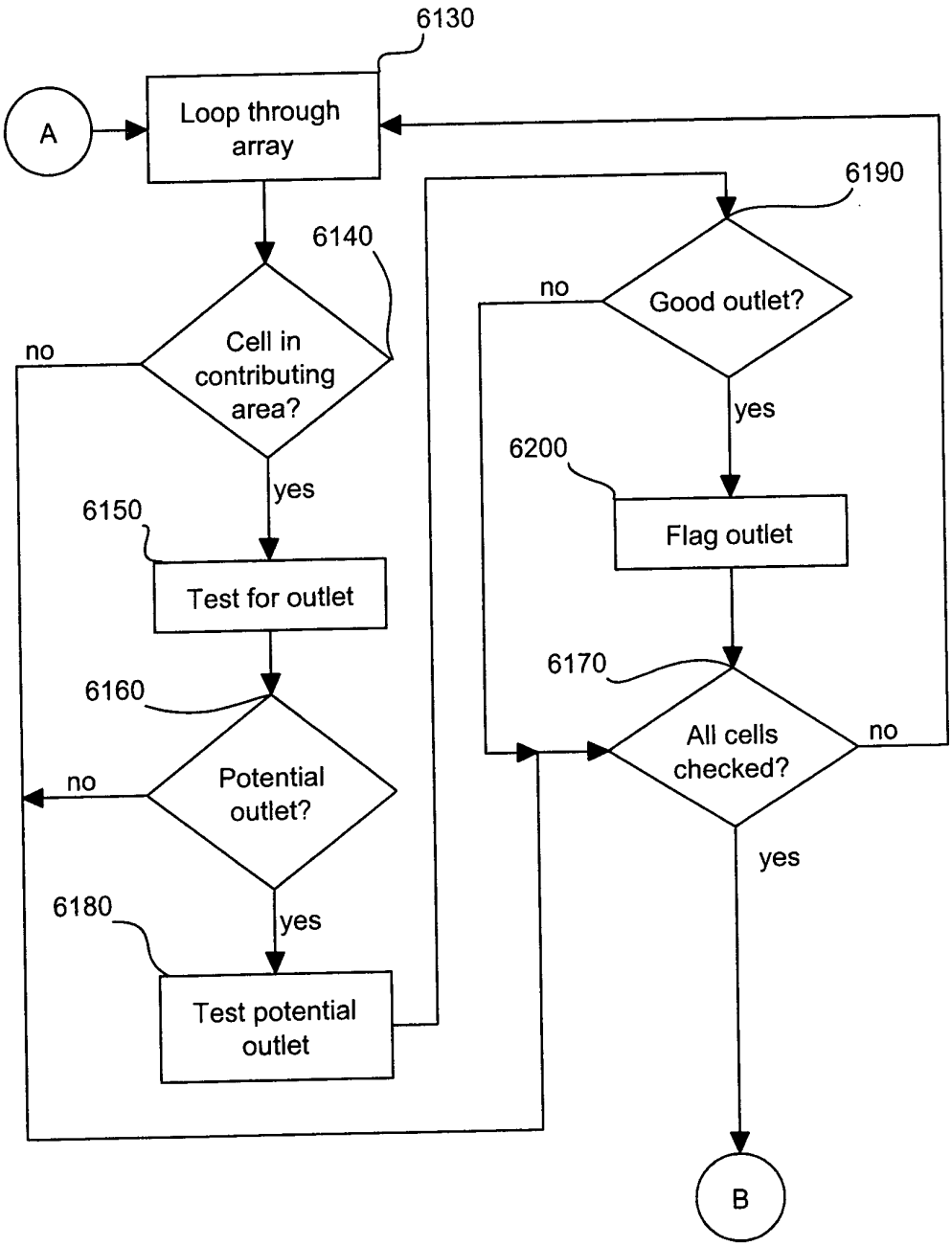

6130
A
Loop through array
6140
Cell in contributing area?
no
yes
6150
Test for outlet
6160
Potential outlet?
no
yes
6180
Test potential outlet
6190
Good outlet?
no
yes
6200
Flag outlet
6170
All cells checked?
no
yes
B

FIG. 9C

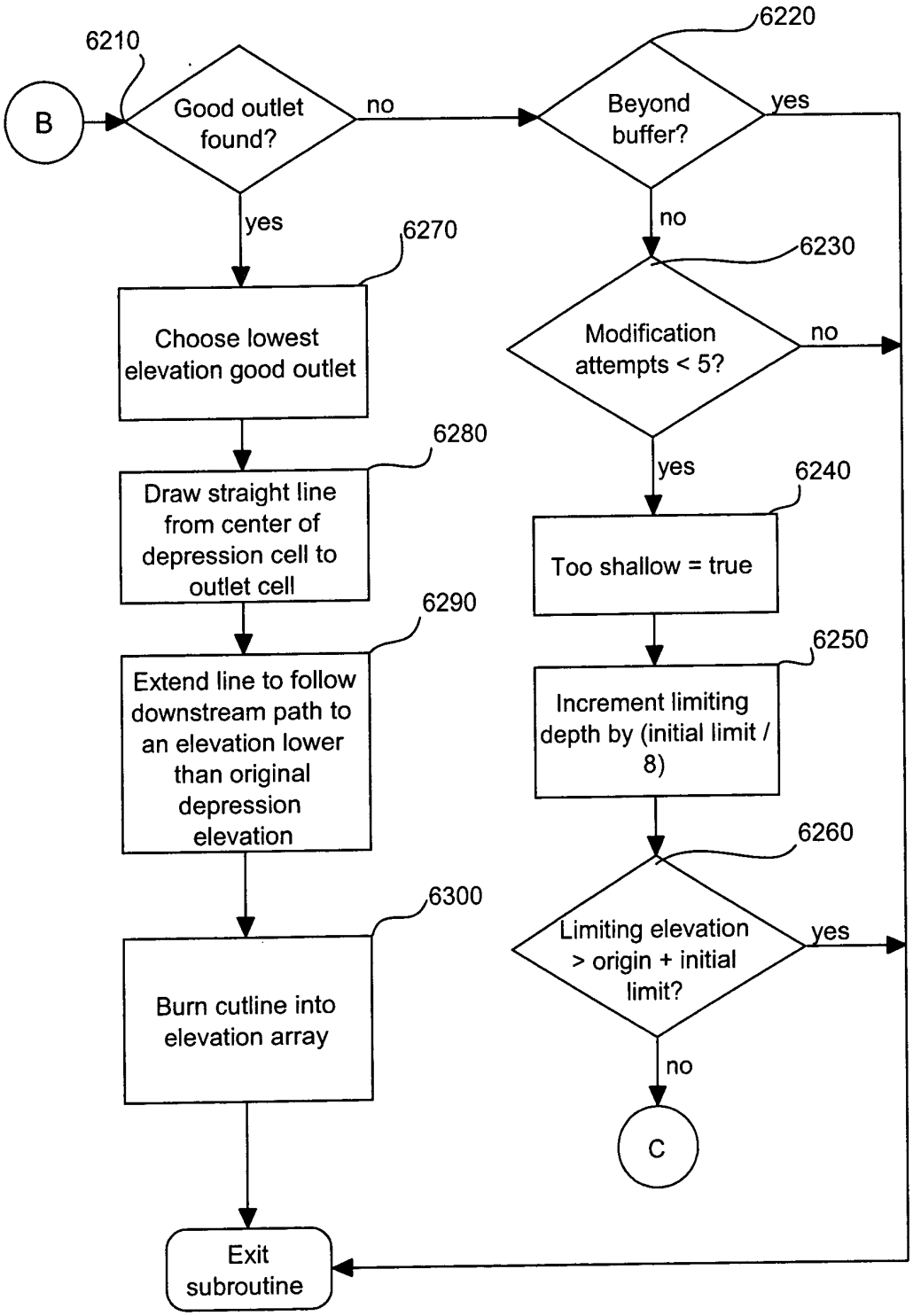

B
6210
Good outlet found?
no
6220
Beyond buffer?
yes
yes
6270
Choose lowest elevation good outlet
6280
Draw straight line from center of depression cell to outlet cell
6290
Extend line to follow downstream path to an elevation lower than original depression elevation
6300
Burn cutline into elevation array
Exit subroutine
no
6230
Modification attempts < 5?
no
yes
6240
Too shallow = true
6250
Increment limiting depth by (initial limit / 8)
6260
Limiting elevation > origin + initial limit?
yes
no
C

FIG. 10

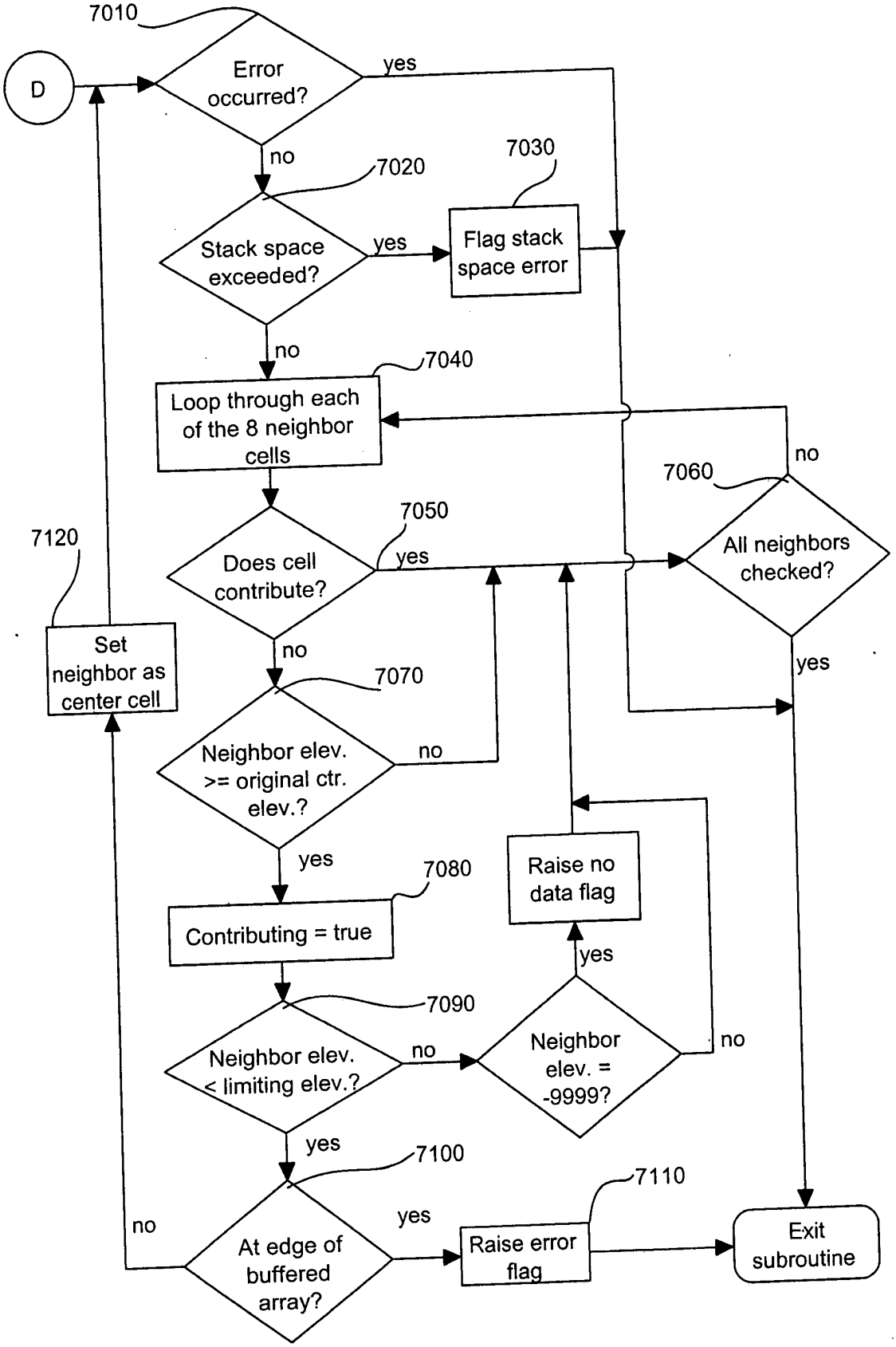

D
7010
Error occurred?
yes
no
7020
Stack space exceeded?
yes
7030
Flag stack space error
no
7040
Loop through each of the 8 neighbor cells
7050
Does cell contribute?
yes
no
7060
All neighbors checked?
no
yes
7070
Neighbor elev. >= original ctr. elev.?
no
yes
7080
Contributing = true
7090
Neighbor elev. < limiting elev.?
no
yes
Raise no data flag
Neighbor elev. = -9999?
no
yes
7100
At edge of buffered array?
no
yes
7110
Raise error flag
Exit subroutine
7120
Set neighbor as center cell

FIG. 11

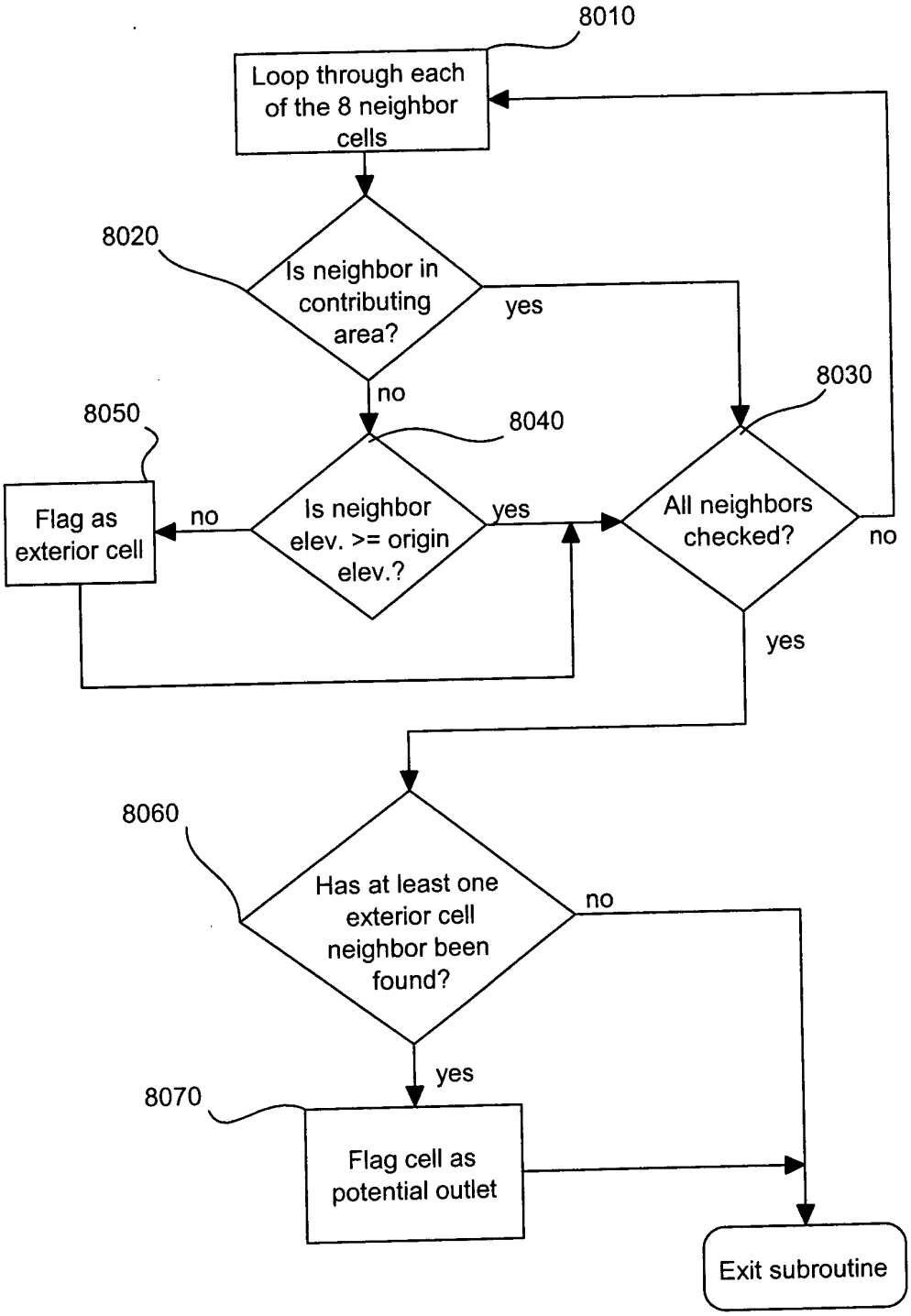

8010
Loop through each of the 8 neighbor cells
8020
Is neighbor in contributing area?
yes
no
8030
8040
8050
Flag as exterior cell
no
Is neighbor elev. >= origin elev.?
yes
All neighbors checked?
no
yes
8060
Has at least one exterior cell neighbor been found?
no
yes
8070
Flag cell as potential outlet
Exit subroutine

FIG. 12

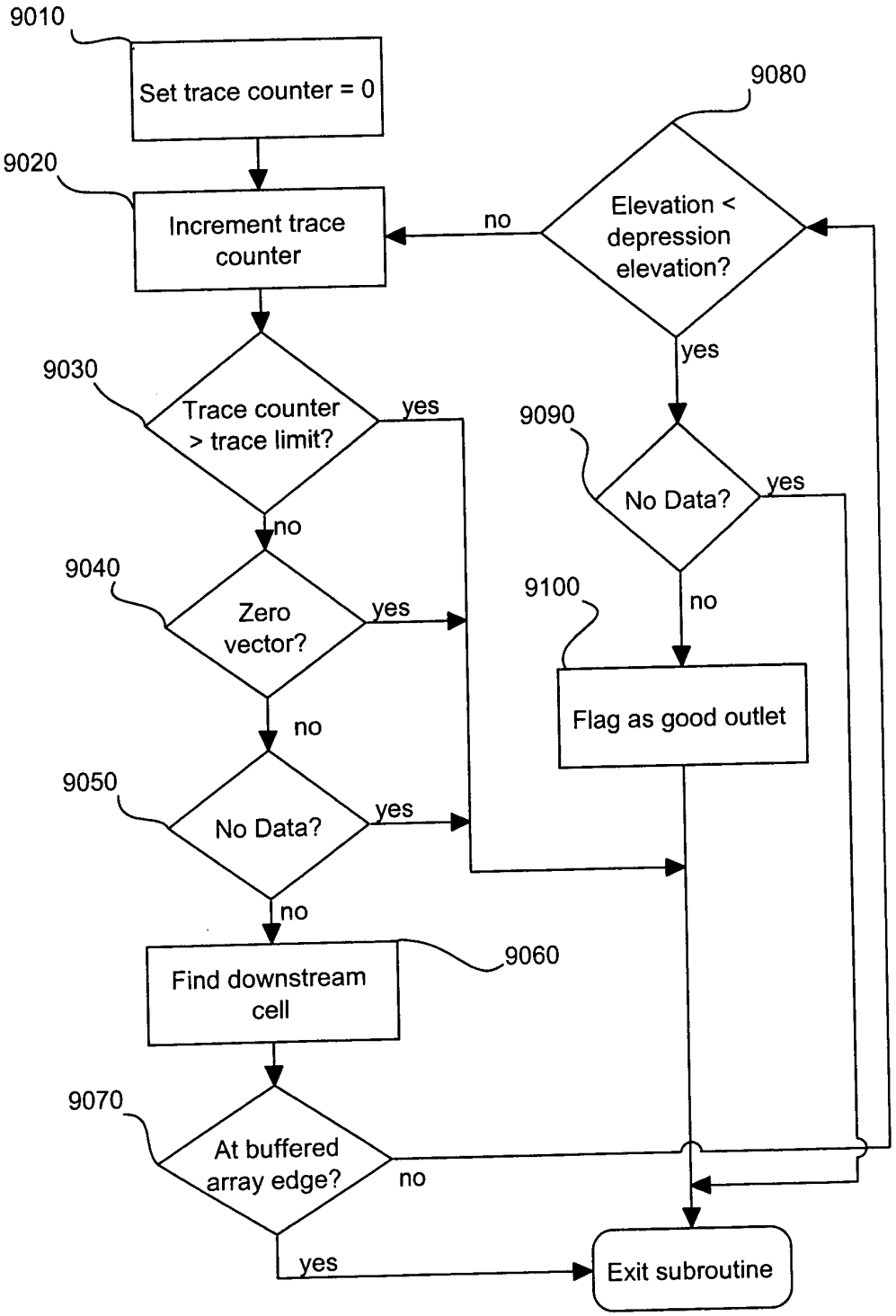

9010
Set trace counter = 0
9020
Increment trace counter
9030
Trace counter > trace limit?
yes
no
9040
Zero vector?
yes
no
9050
No Data?
yes
no
9060
Find downstream cell
9070
At buffered array edge?
no
yes
Exit subroutine
9080
Elevation < depression elevation?
no
yes
9090
No Data?
yes
no
9100
Flag as good outlet

FIG. 13A

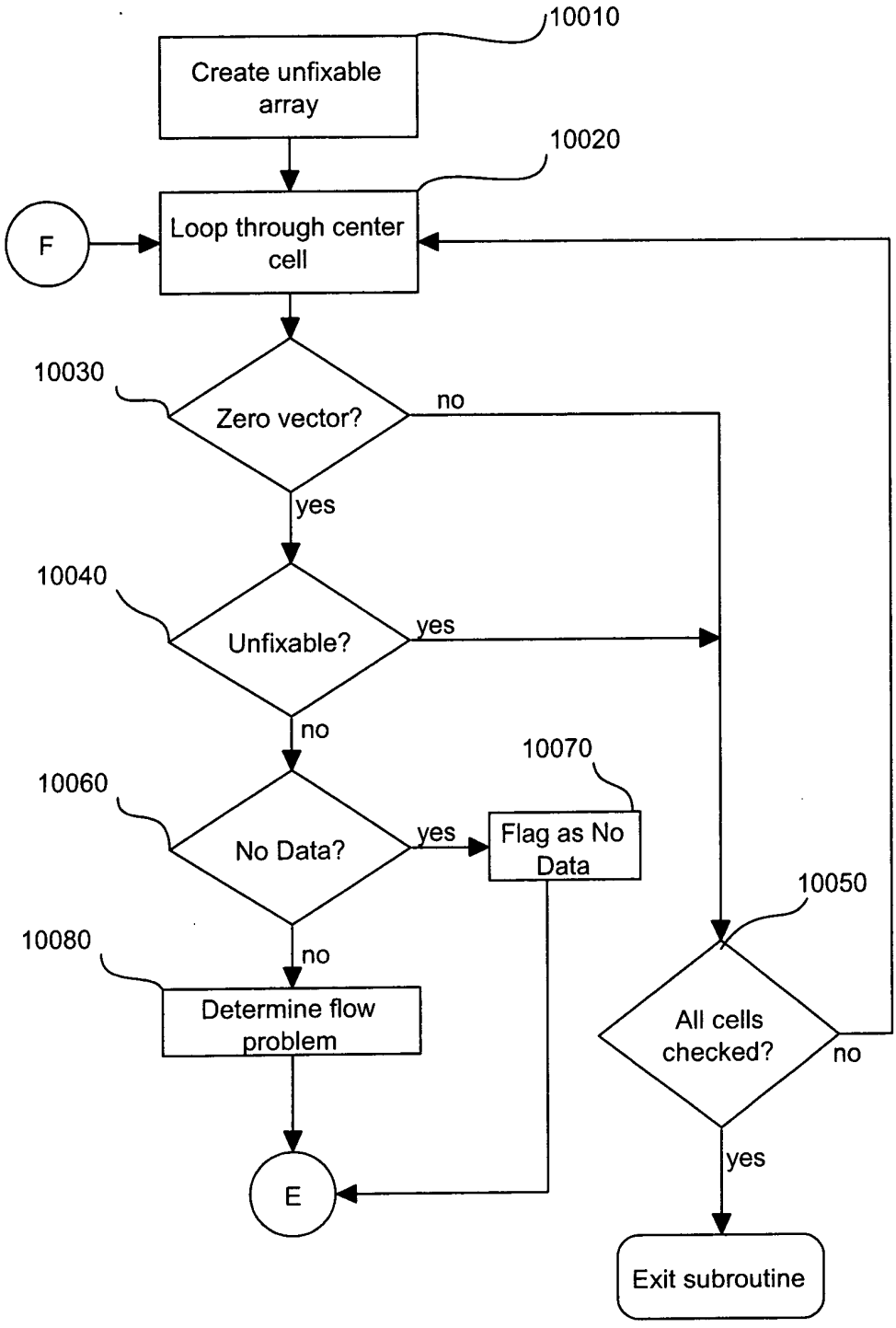

10010
Create unfixable array
10020
F
Loop through center cell
10030
Zero vector?
no
yes
10040
Unfixable?
yes
no
10070
10060
No Data?
yes
Flag as No Data
10050
10080
no
Determine flow problem
All cells checked?
no
yes
E
Exit subroutine

FIG. 13B

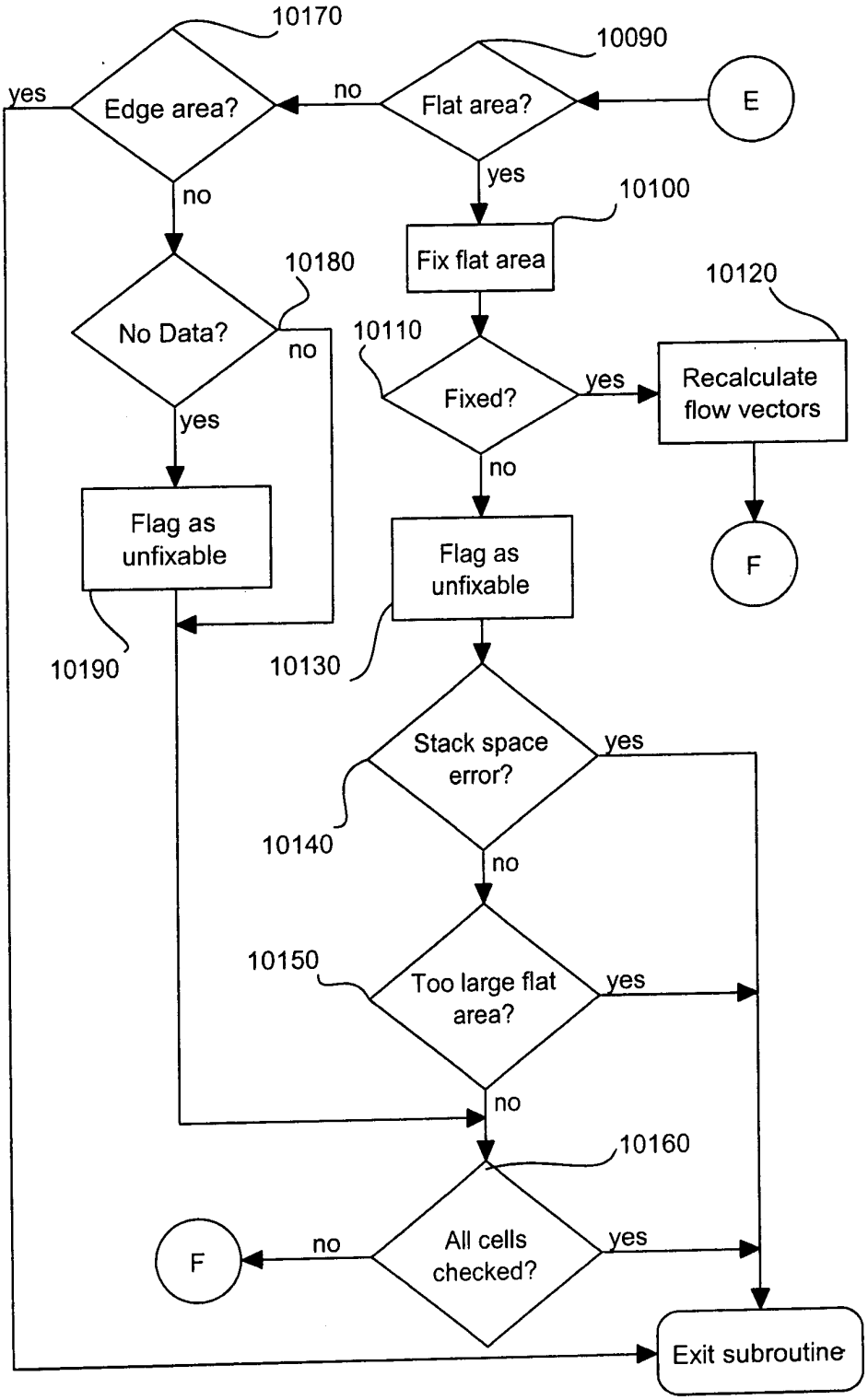

10170
10090
yes
Edge area?
no
Flat area?
E
yes
no
10100
Fix flat area
10180
10120
No Data?
10110
no
Fixed?
yes
Recalculate flow vectors
yes
no
Flag as unfixable
Flag as unfixable
F
10190
10130
Stack space error?
yes
10140
no
10150
Too large flat area?
yes
no
10160
All cells checked?
F
no
yes
Exit subroutine

FIG. 14

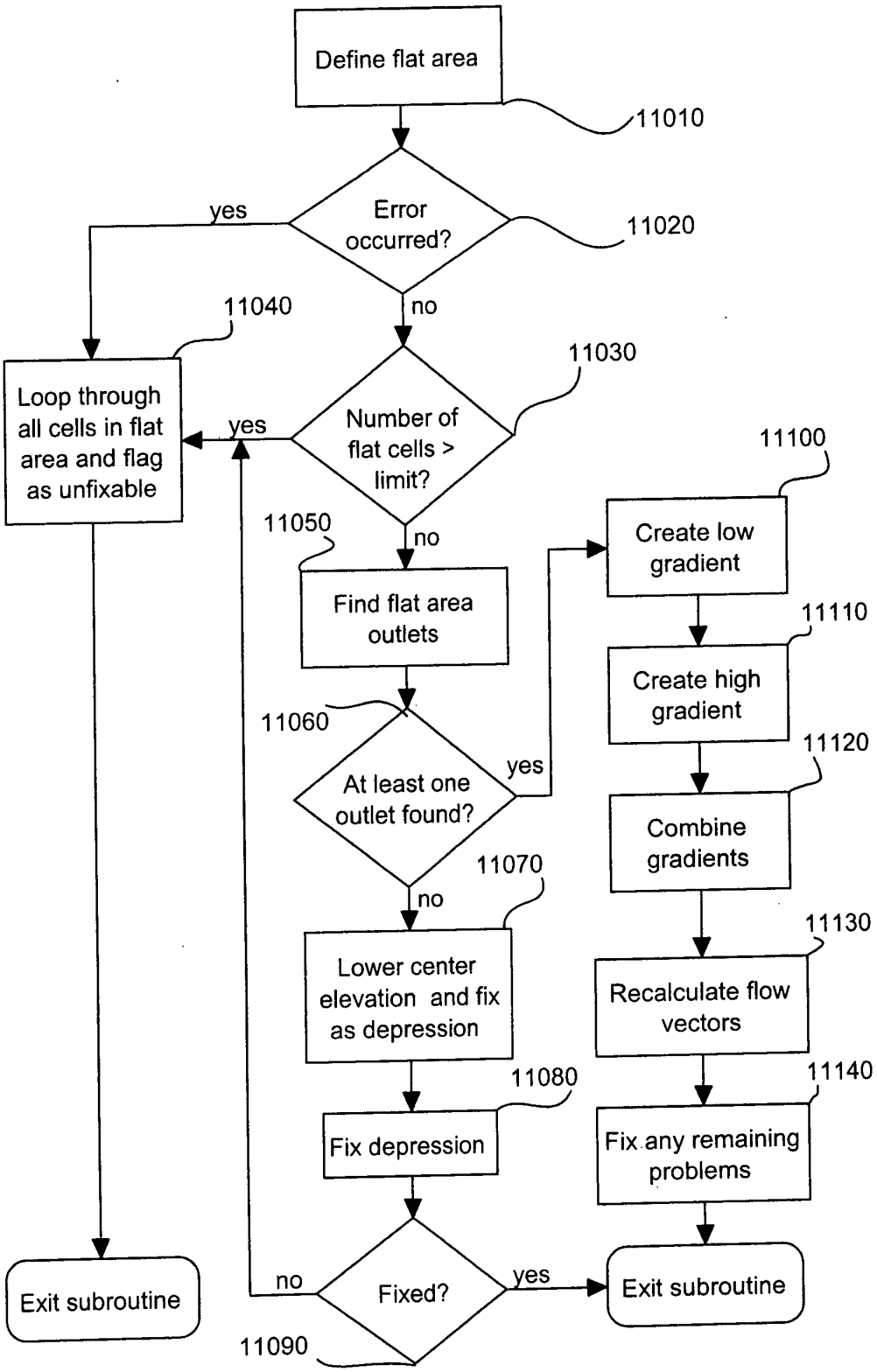

Define flat area
11010
Error occurred?
11020
yes
no
11040
Loop through all cells in flat area and flag as unfixable
11030
Number of flat cells > limit?
yes
no
11050
Find flat area outlets
11060
At least one outlet found?
yes
no
11070
Lower center elevation and fix as depression
11080
Fix depression
Fixed?
no
yes
11090
Exit subroutine
11100
Create low gradient
11110
Create high gradient
11120
Combine gradients
11130
Recalculate flow vectors
11140
Fix any remaining problems
Exit subroutine

FIG. 15

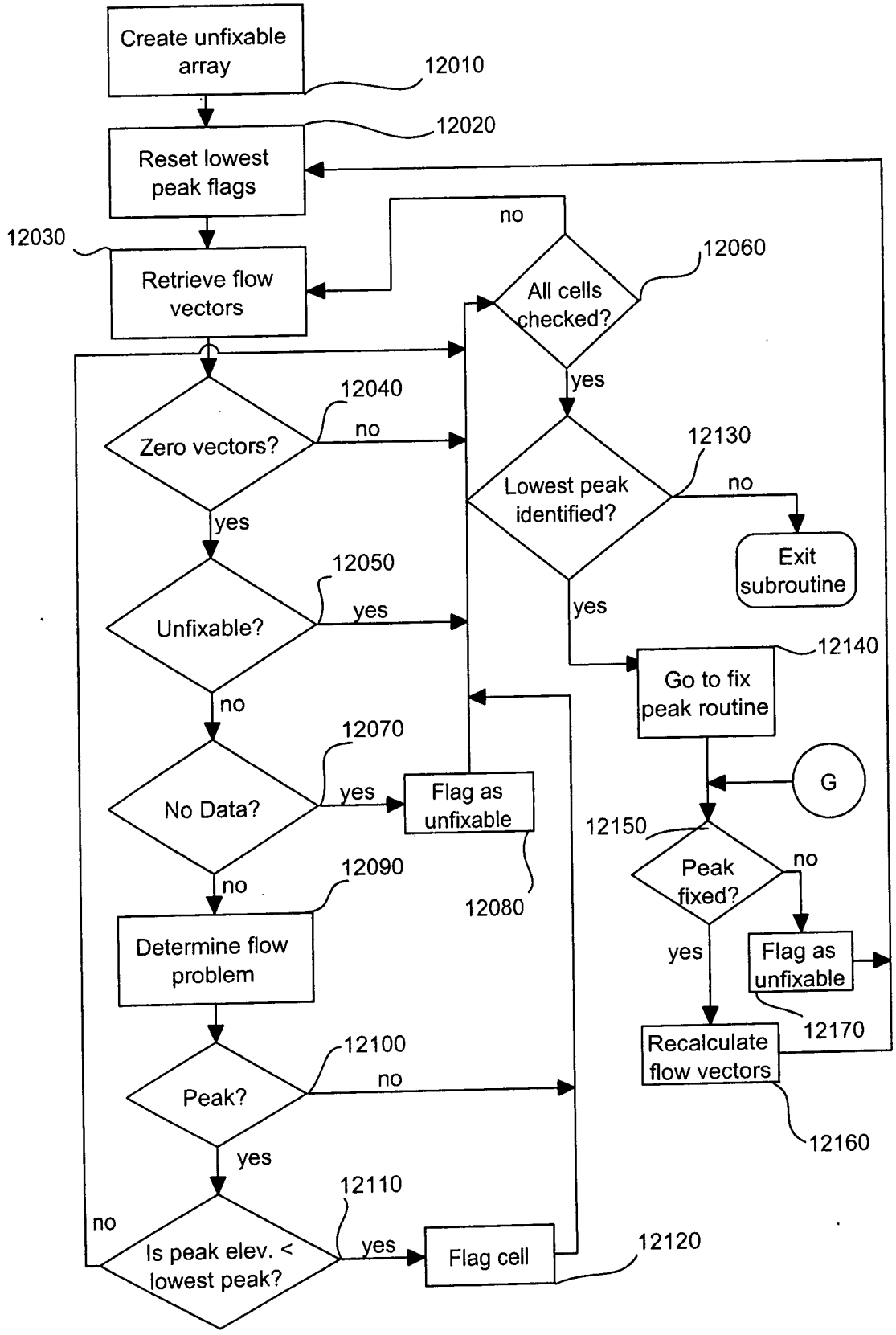

Create unfixable array
12010
Reset lowest peak flags
12020
12030
Retrieve flow vectors
no
All cells checked?
12060
yes
Zero vectors?
12040
no
yes
Lowest peak identified?
12130
no
Exit subroutine
yes
Unfixable?
12050
yes
no
Go to fix peak routine
12140
G
No Data?
12070
yes
Flag as unfixable
12080
12150
Peak fixed?
no
yes
Flag as unfixable
12170
no
12090
Determine flow problem
Recalculate flow vectors
12160
Peak?
12100
no
yes
12110
no
Is peak elev. < lowest peak?
yes
Flag cell
12120

FIG. 16A

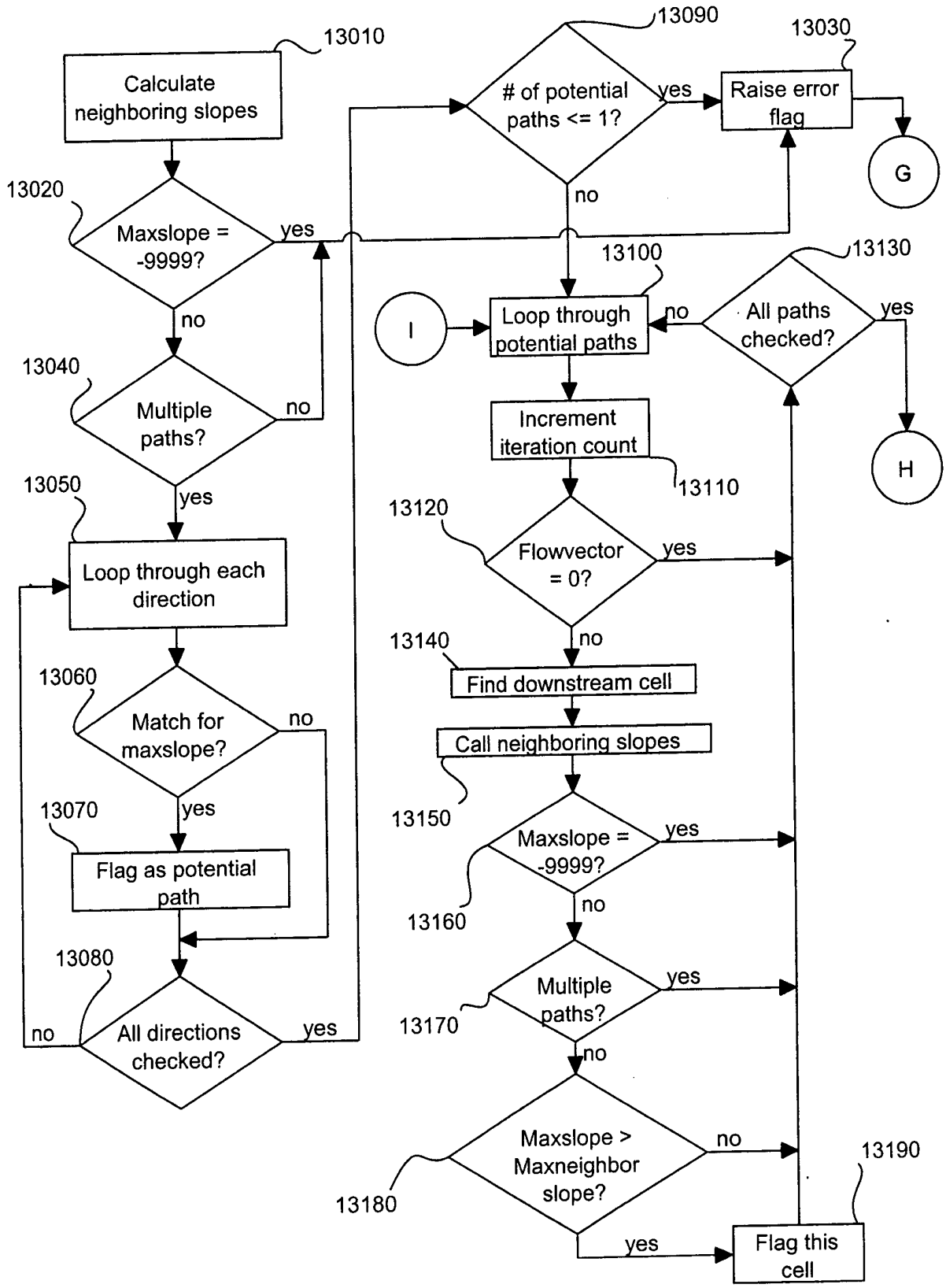
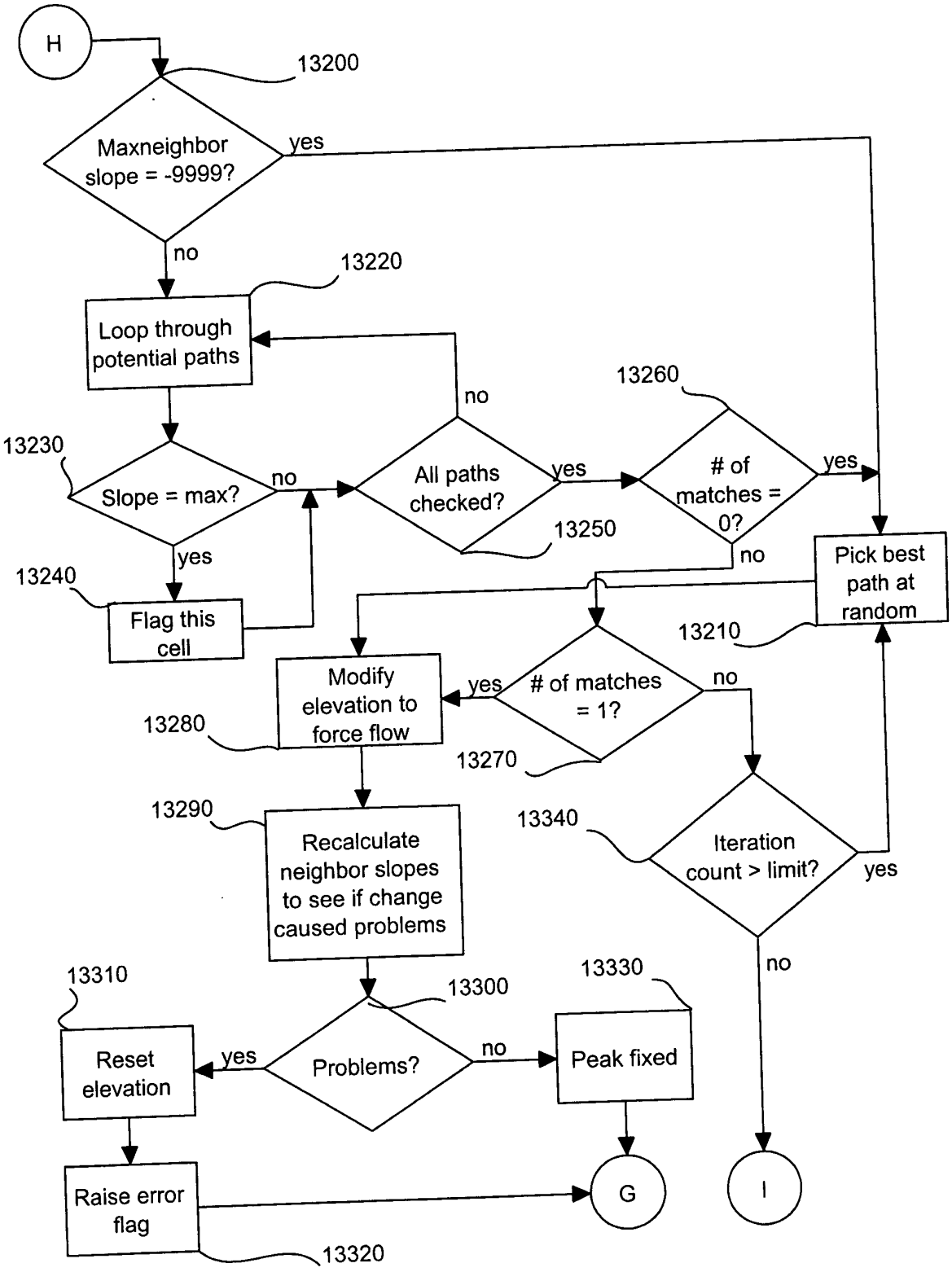

13010
Calculate neighboring slopes
13020
Maxslope = -9999?
yes
no
13040
Multiple paths?
no
yes
13050
Loop through each direction
13060
Match for maxslope?
no
yes
13070
Flag as potential path
13080
All directions checked?
no
yes
13090
# of potential paths <= 1?
yes
no
13030
Raise error flag
G
13100
I
Loop through potential paths
no
13130
All paths checked?
yes
H
Increment iteration count
13110
13120
Flowvector = 0?
yes
no
13140
Find downstream cell
Call neighboring slopes
13150
Maxslope = -9999?
yes
13160
no
Multiple paths?
yes
13170
no
Maxslope > Maxneighbor slope?
no
13180
yes
13190
Flag this cell

FIG. 16B


H
13200
Maxneighbor slope = -9999?
yes
no
13220
Loop through potential paths
13230
Slope = max?
no
yes
13240
Flag this cell
All paths checked?
yes
no
13250
13260
# of matches = 0?
yes
no
Pick best path at random
13210
# of matches = 1?
yes
no
13270
Modify elevation to force flow
13280
13290
Recalculate neighbor slopes to see if change caused problems
13300
Problems?
yes
no
13310
Reset elevation
13330
Peak fixed
Raise error flag
13320
G
13340
Iteration count > limit?
yes
no
I